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(54) **HIGH-SPEED MAGNETIC TROLLEY**

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H02K 49/04	(2006.01)
B60T 13/74	(2006.01)
F16D 63/00	(2006.01)
F16D 121/20	(2012.01)

(52) **U.S. Cl.**

CPC ***B61H 9/02*** (2013.01); ***B60T 13/748*** (2013.01); ***F16D 63/002*** (2013.01); ***F16D 63/008*** (2013.01); ***H02K 49/046*** (2013.01); *F16D 2121/20* (2013.01)

(58) **Field of Classification Search**

CPC H02K 49/04; H02K 49/046; A63G 21/22; A63G 21/20; B60L 7/28; B61H 9/02; B61B 7/00; B61B 12/02; E01B 25/18; B60T 13/748; F16D 63/002; F16D 63/008; F16D 2121/20

USPC 104/113, 115; 105/150

See application file for complete search history.

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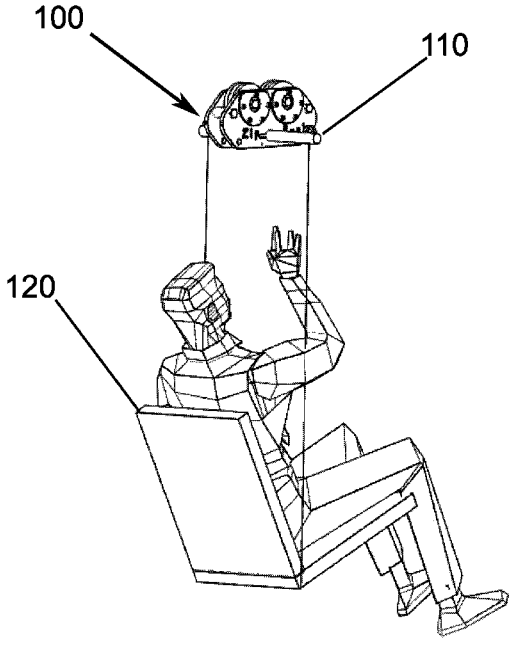
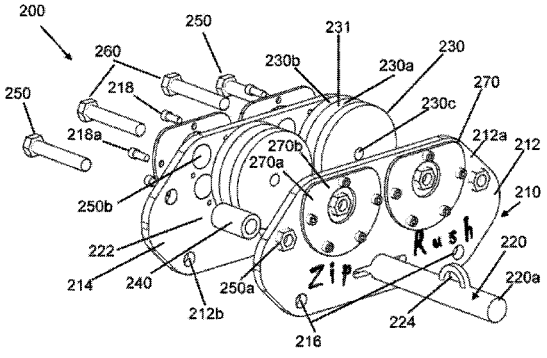
(57) **ABSTRACT**

A high-speed magnetic trolley that utilizes an eddy current brake that may reduce the speed of a person in a harness traveling on a relatively steep zip line cable, making it possible to reach a landing brake at a reasonable speed and becomes easy to adjust an amount of braking force needed to reach a desired speed by taking off or adding more magnets without throwing one or more aluminum wheels out of balance. The high-speed magnetic trolley produce an eddy current that generates an opposing magnetic field, which then resists rotation of one or more aluminum wheels providing braking force.

14 Claims, 5 Drawing Sheets





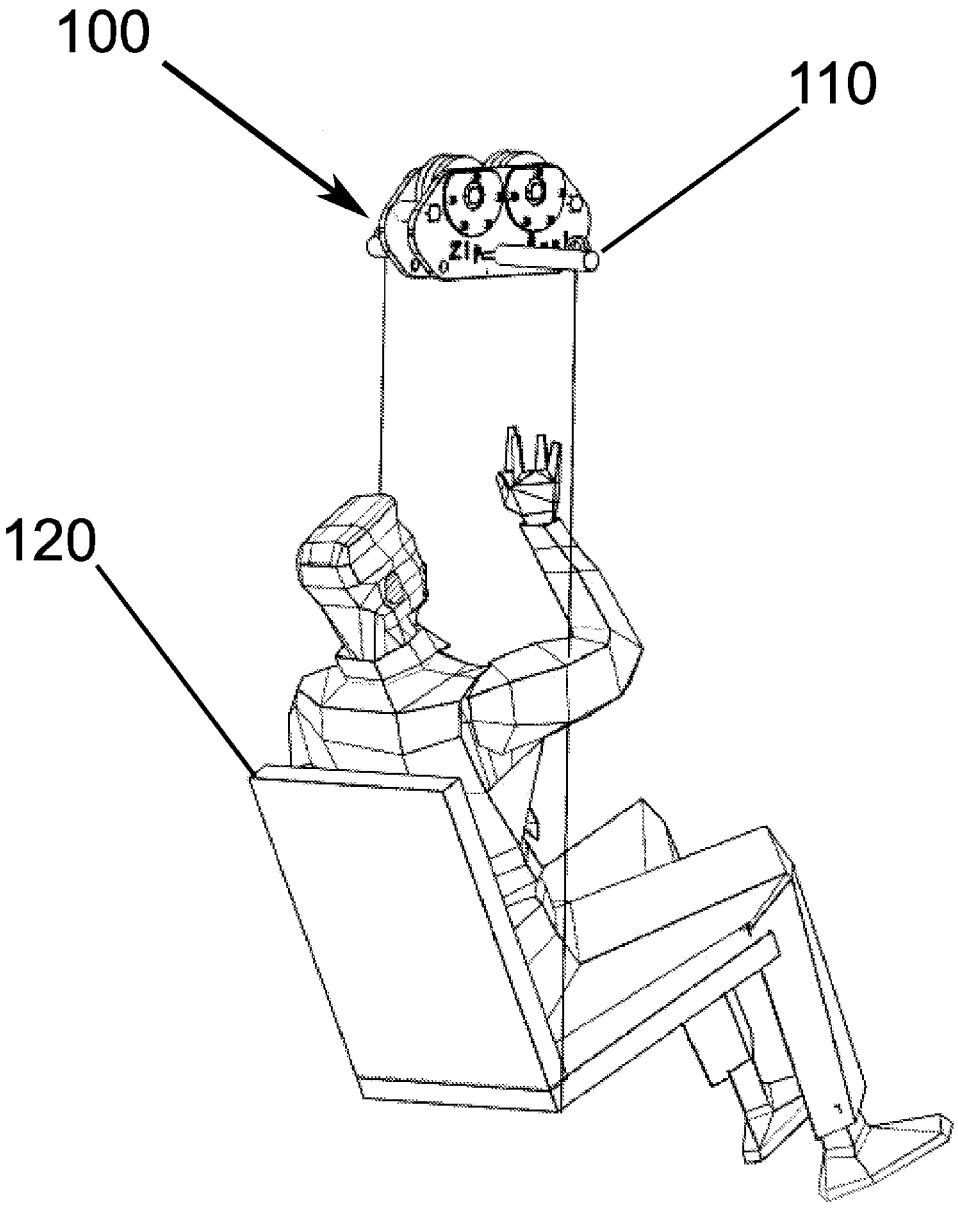
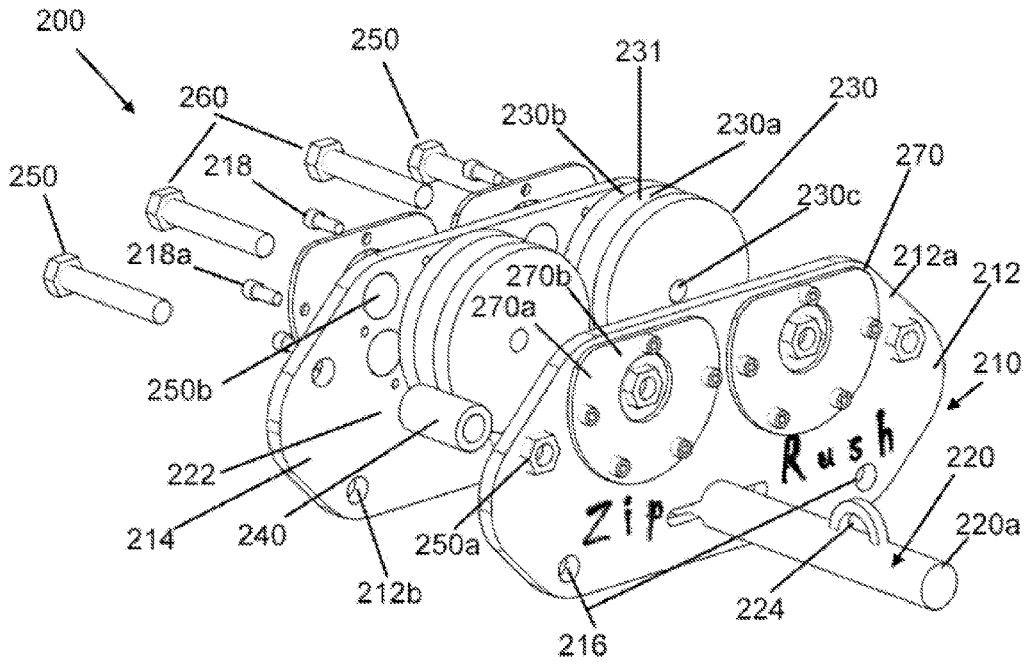


FIG. 1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250
231
260
230b
230a
230
250
218
270
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218a
212a
212
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Zip
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224
216

FIG.2

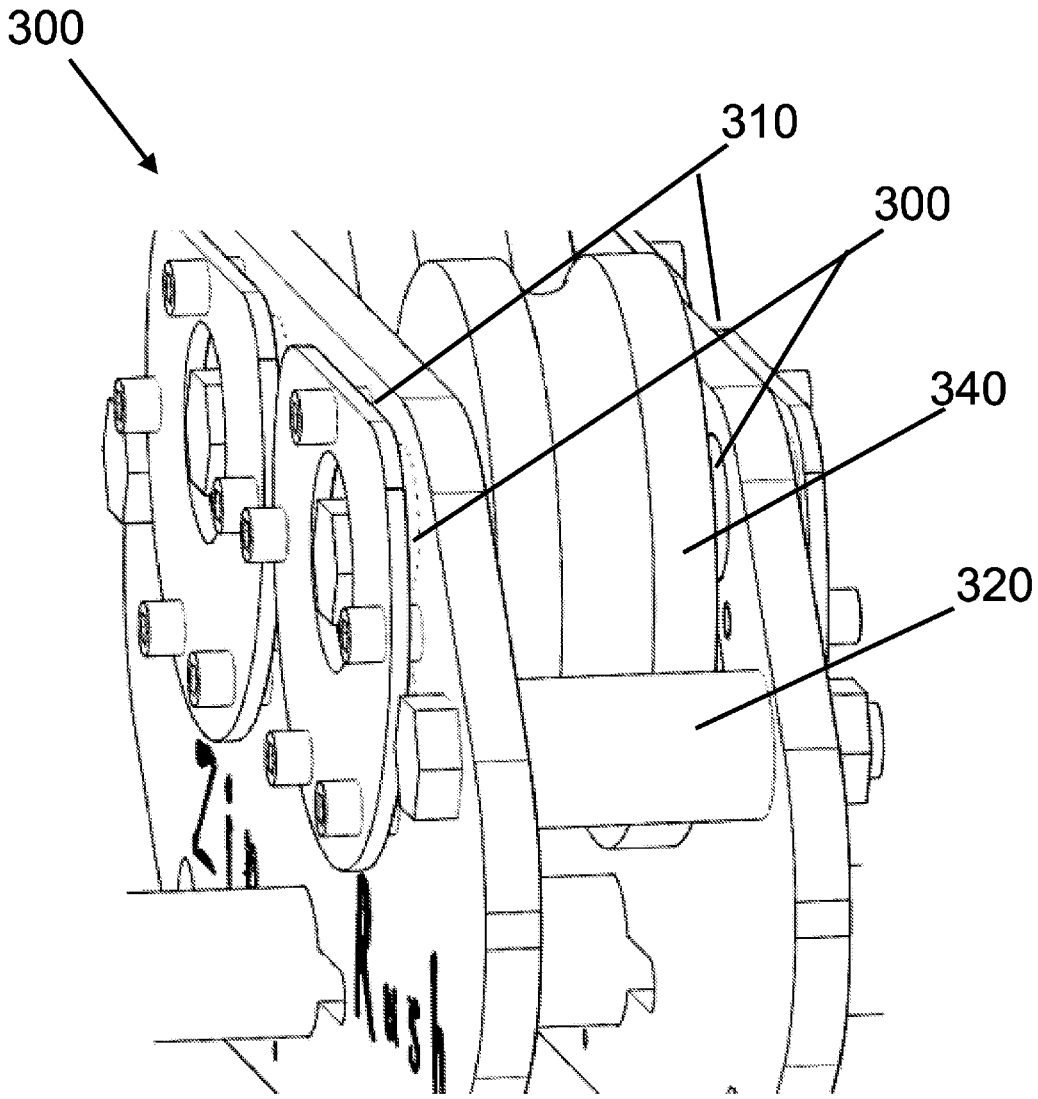


FIG.3

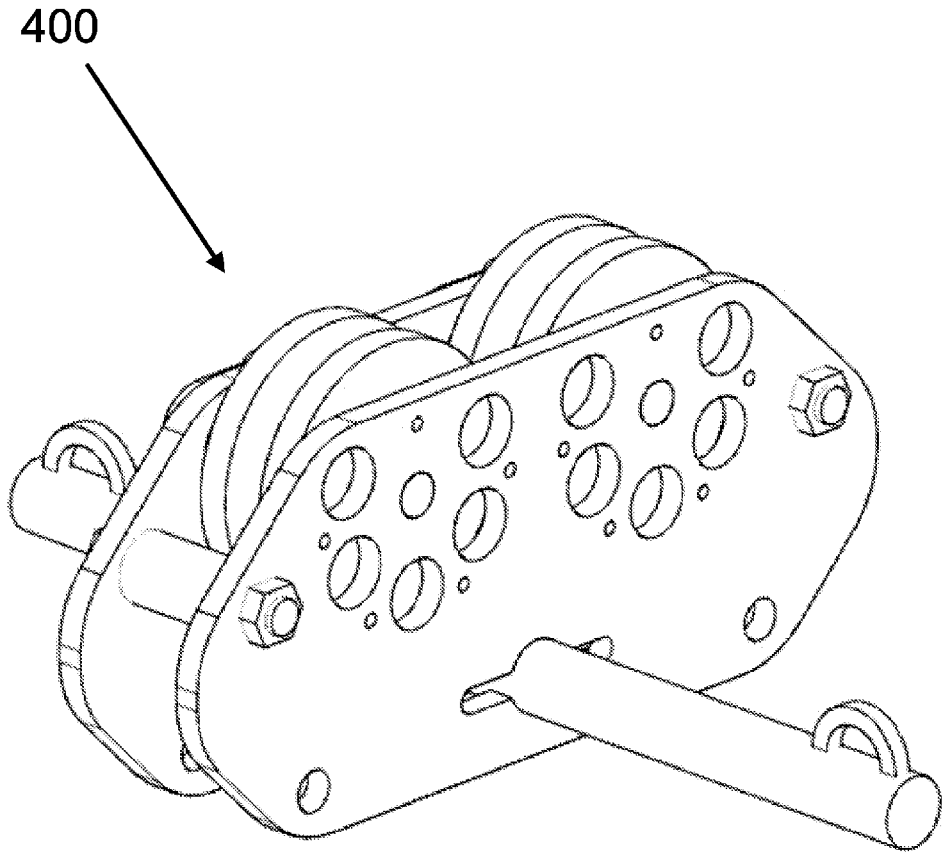
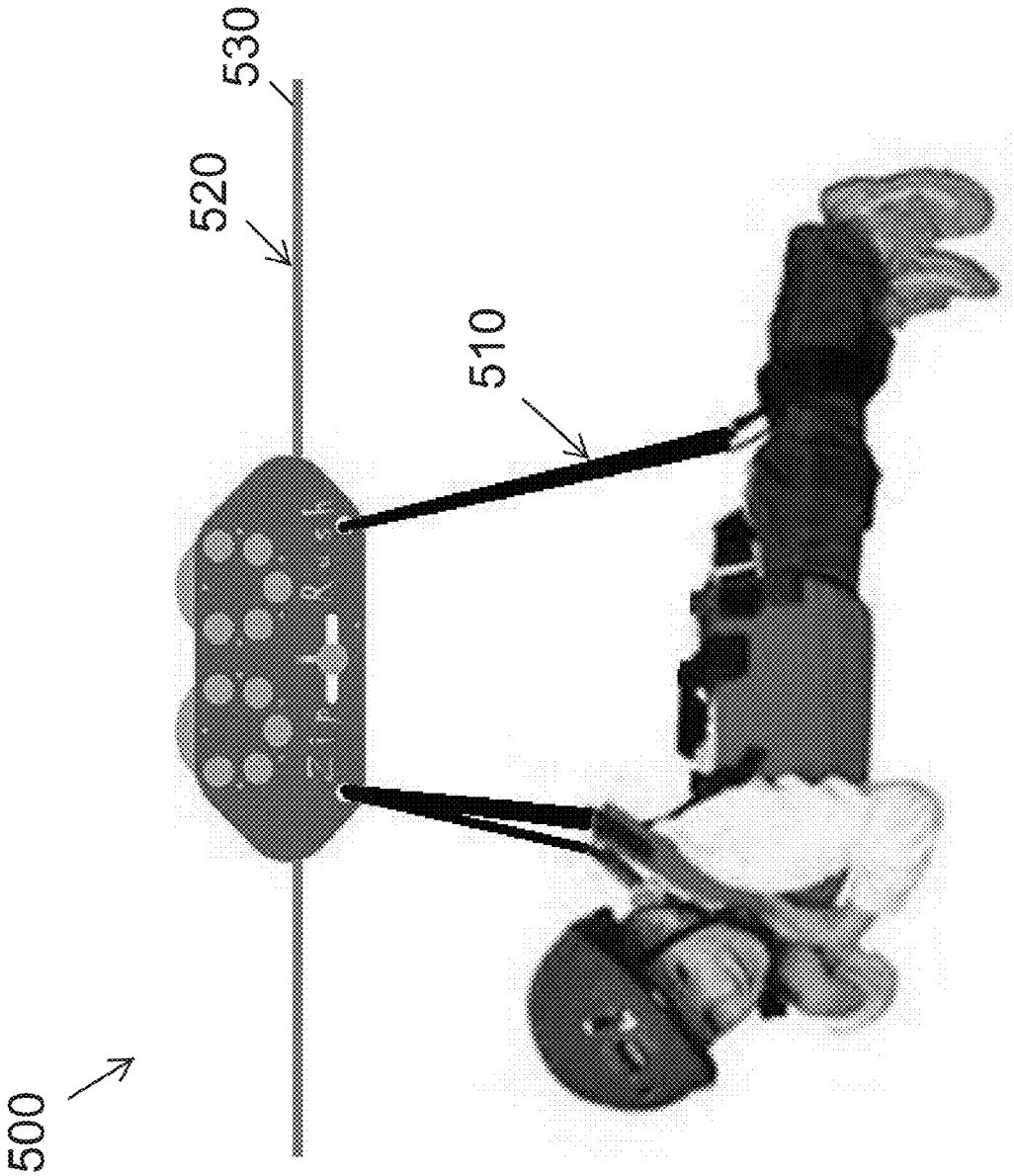


FIG.4

FIG. 5



HIGH-SPEED MAGNETIC TROLLEY

This application claims priority to U.S. Provisional Application 61/658,259 filed on Jun. 11, 2012, the entire disclosure of which is incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is a magnetic trolley. More specifically, the present invention is a high-speed magnetic trolley.

2. Description of the Related Art

Trolleys may be utilized with a harness to travel along a zip line cable over an area. Many times a person on a zip line cable travelling over an area may go too fast and travel at dangerous speeds. There are trolleys utilizing speed control devices but none that utilizes an eddy current device that also may be used with other types of harnesses used in combination with a zip line cable. The friction trolley device utilizes the rider's weight to counterbalance against a brake pad on a zip line cable as a user travels downward.

BRIEF SUMMARY OF THE INVENTION

The present invention is a magnetic trolley. More specifically, the present invention is a high-speed magnetic trolley.

The high-speed magnetic trolley includes a body having a pair of planar trapezoidal shape parallel plates. The pair of parallel plates includes a plurality of harness coupling apertures to accommodate a chair harness, a climbing harness or a horizontal harness and a removable bar extended through a pair of aligned apertures disposed on the pair of parallel plates. The removable bar is utilized as a harness anchor when the trolley is ridden with the chair harness, wherein the removable bar is fitted with a harness attachment loop to act as an attachment point for the chair harness. The high-speed magnetic trolley also includes a plurality of wheels placed between the pair of parallel plates, the wheels each include a fitted track on a middle circumference portion of the wheels to accommodate the zip line cable. The thickness of one or more spacers define the air gap between the magnets and the aluminum wheel, the air gap between the one or more magnets and the wheels may be adjusted in the range of 1/32 of an inch to 1/4 of an inch to provide more or less braking capability and reduce heat buildup.

The high-speed magnetic trolley additionally includes a plurality of body bolts extended through a first set of corresponding apertures, the first set of corresponding apertures are disposed on the pair of parallel plates and the body bolts to couple the one or more spacers in place. A plurality of axles is extended through a second set of apertures disposed on the pair of parallel plates and a centered aperture disposed on each of the wheels. The axles are coupled to the wheels in place while allowing the wheels to rotate and a plurality of magnet holder plates are coupled to an exterior facing of the pair of parallel plates on an opposite side of the pair of parallel plates adjacent to the wheels. The magnet holder plates are coupled with a plurality of fasteners and the magnet holder plates are generally planar shaped and include apertures to accommodate where the magnets goes through. Only the magnetic holder plates keep the magnets in place. The one or more magnets placed inside the high-speed magnetic trolley are in the range of 1 to 20 in order to adjust an amount of braking power and the one or more magnets are coupled in place magnetically by the magnet holder plates.

It is an object of the present invention to provide a high-speed magnetic trolley that utilizes an eddy current brake that may reduce the speed of a person in a harness traveling on a relatively steep zip line cable, making it possible to reach a landing brake at a reasonable speed.

It is an object of the present invention to provide a high-speed magnetic trolley that becomes relatively easy to adjust the amount of braking force needed to reach a desired speed by taking off or adding more magnets without throwing one or more aluminum wheels out of balance.

It is an object of the present invention to provide a high-speed magnetic trolley that generates an opposing magnetic field, which then resists rotation of one or more aluminum wheels providing braking force.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described by way of exemplary embodiments, but not limitations, illustrated in the accompanying drawings in which like references denote similar elements, and in which:

FIG. **1** illustrates a side environmental perspective view of a high-speed magnetic trolley, in accordance with one embodiment of the present invention.

FIG. **2** illustrates an exploded perspective side view of a high-speed magnetic trolley, in accordance with one embodiment of the present invention.

FIG. **3** illustrates a front perspective view of a plurality of magnets and a plurality of magnetic plates, in accordance with one embodiment of the present invention.

FIG. **4** illustrates a side perspective view of a high-speed magnetic trolley, in accordance with one embodiment of the present invention.

FIG. **5** illustrates a side perspective view of a horizontal chair harness and a high-speed magnetic trolley, in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

Various aspects of the illustrative embodiments will be described using terms commonly employed by those skilled in the art to convey the substance of their work to others skilled in the art. However, it will be apparent to those skilled in the art that the present invention may be practiced with only some of the described aspects. For purposes of explanation, specific numbers, materials and configurations are set forth in order to provide a thorough understanding of the illustrative embodiments. However, it will be apparent to one skilled in the art that the present invention may be practiced without the specific details. In other instances, well-known features are omitted or simplified in order not to obscure the illustrative embodiments.

Various operations will be described as multiple discrete operations, in turn, in a manner that is most helpful in understanding the present invention however the order of description should not be construed as to imply that these operations are necessarily order dependent. In particular, these operations need not be performed in the order of presentation.

The phrase "in one embodiment" is used repeatedly. The phrase generally does not refer to the same embodiment, however, it may. The terms "comprising", "having" and "including" are synonymous, unless the context dictates otherwise.

FIG. **1** illustrates a side environmental perspective view of a high-speed magnetic trolley **100**, in accordance with one embodiment of the present invention.

The high-speed magnetic trolley **100** includes a removable bar **110**. The removable bar **110** may be utilized as a harness

anchor that may be ridden with a chair harness **120** commonly utilized with parasailing or other suitable activity. The high-speed magnetic trolley **100** may be utilized with a horizontal harness (FIG. **5**, **510**) for relatively greater speed than the chair harness **120** or any other suitable type of harness.

FIG. **2** illustrates an exploded perspective side view of a high-speed magnetic trolley **200**, in accordance with one embodiment of the present invention.

The high-speed magnetic trolley **200** may include a body **210**, a removable bar **220**, a plurality of wheels **230**, one or more spacers **240**, a plurality of body bolts **250**, a plurality of axles **260** and a plurality of magnet holder plates **270**. The body **210** may have a pair of parallel plates **212** that may have a planar trapezoidal shape **214** or other suitable shape such as a rectangle. The pair of parallel plates **212** may also include a plurality of harness coupling apertures **216** to accommodate coupling a chair harness (FIG. **1**, **120**), a horizontal harness (FIG. **5**, **510**) or any other suitable type of harness. The pair of parallel plates **212** may be made of aluminum or other suitable lightweight material that may allow an eddy current. The removable bar **220** may be extended through a pair of aligned apertures **222** disposed on the pair of parallel plates **212**. The removable bar **220** may include a harness attachment loop **224** disposed on each end **220***a* of the removable bar **220** to accommodate coupling the chair harness (FIG. **1**, **120**) to the removable bar **220**. The removable bar **220** may also be removed to place the high-speed magnetic trolley **200** on a zip line cable (FIG. **5**, **520**) that may be a steel cable (FIG. **5**, **530**) or a rope or a synthetic cable that is also a suitable zip line cable. The removable bar **220** may also be made of stainless steel or other suitable material. The wheels **230** may be two wheels **230** or any suitable number of wheels to operate the high-speed magnetic trolley **200**. The wheels **230** may be placed between the pair of parallel plates **212** and may include a fitted track **230***a* on a middle circumference portion **230***b* of the wheels **230** that accommodates the zip line cable (FIG. **5**, **520**) that rotates while in contact with the zip line cable (FIG. **5**, **520**) that may be a rope or a synthetic cable that is also a suitable zip line cable. The wheels **230** may also have a rubber coating **231** on the middle circumference portion **230***b*. The wheels **230** may also be made of aluminum, polyurethane or other suitable material that may be suitable for braking in accordance with the eddy current principle. The one or more spacers **240** define an open area between the pair of parallel plates **212** where the wheels **230** may be placed. The one or more spacers **240** may be made of aluminum or other suitable lightweight material that allows an eddy current. The body bolts **250** may extend through a first set of corresponding apertures **250***a* disposed on the pair of parallel plates **212** to couple the one or more spacers **240** in place. The body bolts **250** may be made of stainless steel or other suitable material. The axles **260** may extend through a second set of apertures **250***b* disposed on the pair of parallel plates **212** and a centered aperture **230***c* disposed on each of the wheels **230** to couple the wheels **230** in place while allowing the wheels **230** to rotate. The axles **260** may be made of stainless steel or other suitable material. The magnet holder plates **270** may be coupled to an exterior facing **212***a* of the pair of parallel plates **212** on an opposite side **212***b* of the pair of parallel plates **212** adjacent to the wheels **230** with a plurality of fasteners **218** such as a plurality of bolts **218***a* or other suitable fastener. The magnet holder plates **270** may be generally planar shaped **270***a* and may include an aperture **270***b* to accommodate one or more magnets (FIG. **3**, **300**). The magnet holder plates **270** may be made of steel or other suitable material.

The high-speed magnetic trolley may operate as an integrated adjustable magnetic brake. By incorporating a magnet inside an aperture of a body of the high-speed magnetic trolley, the high-speed magnetic trolley may be slowed down to a more manageable speed on relatively steep slopes. The high-speed magnetic trolley may operate according to an eddy current principle that tends to slow down movement between aluminum and one or more magnets. The more speed or movement between the aluminum and the one or more magnets, the more current may be created, therefore increasing the effect of slowing down the wheels of the high-speed magnetic trolley. The body, wheels and all spacers of the high-speed magnetic trolley may be made of aluminum for relatively lighter weight although the purpose of the wheels being made of aluminum may be for braking. The magnetic holder plate may be made of steel in order to hold the magnets in place. All bolts and axles may be made of stainless steel for reliability, durability and esthetics. To place the high-speed magnetic trolley on a zip line cable, a user must remove a removable bar through an aperture and place the high-speed magnetic trolley on the zip line cable then thread the removable bar back inside the high-speed magnetic trolley through the aperture.

FIG. **3** illustrates a front perspective view of one or more magnets **300** and a plurality of magnetic plates **310**, in accordance with one embodiment of the present invention.

The high-speed magnetic trolley **200** includes the one or more magnets **300**, the magnetic plates **310**, one or more spacers **320**, a pair of parallel plates **330** and a plurality of wheels **340**.

The one or more magnets **300** may be coupled in place magnetically by the magnet holder plates **310**. The one or more spacers **320** may be positioned between the pair of parallel plates **330** that may define an open area between the pair of parallel plates **330** where a plurality of wheels **340** may be placed. The open area between the one or more magnets **300** and the wheels **340** may be adjusted in the approximate range of 1/32 of an inch to ¼ of an inch to provide more or less braking capability. The number of the one or more magnets **300** that may be placed inside the high-speed magnetic trolley **200** may be in the approximate range of 1 to 20 in order to adjust the amount of braking power needed for the application. The greater the number of the one or more magnets **300** that may be placed inside the high-speed magnetic trolley **200**, the greater the amount of braking power needed for the application.

FIG. **4** illustrates a side perspective view of a high-speed magnetic trolley **400**, in accordance with one embodiment of the present invention.

The high-speed magnetic trolley **400** may be without one or more magnets **410** and a plurality of magnetic plates **420**. The magnetic plates **420** may be removed with the one or more magnets **410** to allow the high-speed magnetic trolley **400** to be utilized at full speed without braking. The high-speed magnetic trolley **400** may be utilized with any suitable number and strength of magnets to reduce the speed of the high-speed magnetic trolley **400**.

FIG. **5** illustrates a side perspective view of a horizontal harness **510** and a high-speed magnetic trolley **500**, in accordance with one embodiment of the present invention.

The high-speed magnetic trolley **500** may be utilized with a horizontal harness **510** in contrast to a chair harness (FIG. **1**, **120**). The high-speed magnetic trolley **500** may run along a zip line cable **520** that may be a rope or a synthetic cable that is also a suitable zip line cable.

Use of the high-speed magnetic trolley may be limited to zip line cables with a steep slope. It is hard to define what is considered a steep slope as it depends on the length of the zip line cable. For example, if a 200 meter zip line cable has 40

meters of slope (at an approximate 18 degree angle or 20 percent decline), the speed at landing will probably be too great to land safely. With the utilization of the zip line magnetic brake trolley, it would be possible to reduce the speed considerably to a more manageable landing speed.

While the present invention has been related in terms of the foregoing embodiments, those skilled in the art will recognize that the invention is not limited to the embodiments described. The present invention can be practiced with modification and alteration within the spirit and scope of the appended claims. Thus, the description is to be regarded as illustrative instead of restrictive on the present invention.

What is claimed is:

1. A high-speed magnetic trolley, comprising:

a pair of aligned apertures disposed on a pair of parallel plates;

a plurality of harness coupling apertures;

a body having the pair of parallel plates, the pair of parallel plates includes the plurality of harness coupling apertures to accommodate coupling a harness;

a removable bar extended through the pair of aligned apertures disposed on the pair of parallel plates, the removable bar utilized as a harness anchor that is ridden with a chair harness;

a plurality of wheels placed between the pair of parallel plates, each wheel include a fitted track on a middle circumference portion of each wheel that accommodates a zip line cable, the wheels rotate while in contact with the zip line cable;

one or more spacers that define an open area between the pair of parallel plates where the wheels are placed; a plurality of body bolts extended through a first set of corresponding apertures, the first set of corresponding apertures disposed on the pair of parallel plates and the body bolts to couple the one or more spacers in place;

a plurality of axles extended through a second set of apertures disposed on the pair of parallel plates and a centered aperture disposed on each of the wheels, the axles to couple the wheels in place while allowing the wheels to rotate;

a plurality of magnet holder plates coupled to an exterior facing of the pair of parallel plates on an opposite side of the pair of parallel plates adjacent to the wheels, the magnet holder plates coupled with a plurality of fasteners;

wherein the magnet holder plates are generally planar shaped and include an aperture to accommodate one or more magnets; and

wherein the one or more magnets are coupled in place magnetically by the magnet holder plates.

2. A high-speed magnetic trolley, comprising:

a pair of aligned apertures disposed on a pair of parallel plates;

a plurality of harness coupling apertures;

a body having the pair of parallel plates, the pair of parallel plates includes the plurality of harness coupling apertures to accommodate coupling a harness;

a removable bar extended through a pair of aligned apertures disposed on the pair of parallel plates, the removable bar utilized as a harness anchor that is ridden with a chair harness;

a plurality of wheels placed between the pair of parallel plates, each wheel includes a fitted track on a middle circumference portion of the wheel that accommodates a zip line cable, each wheel has a rubber coating on the middle circumference portion, the wheels rotate while in contact with the zip line cable;

one or more spacers that define an open area between the pair of parallel plates where the wheels are placed, the open area between the one or more magnets and the wheels comprises a distance in the range of 1/32 of an inch to 1/4 of an inch to provide more or less braking capability;

a plurality of body bolts extended through a first set of corresponding apertures, the first set of corresponding apertures disposed on the pair of parallel plates and the body bolts to couple the one or more spacers in place;

a plurality of axles extended through a second set of apertures disposed on the pair of parallel plates and a centered aperture disposed on each of the wheels, the axles to couple the wheels in place while allowing the wheels to rotate; and a plurality of magnet holder plates coupled to an exterior facing of the pair of parallel plates on an opposite side of the pair of parallel plates adjacent to the wheels, the magnet holder plates coupled with a plurality of fasteners and the magnet holder plates are generally planar shaped and include an aperture to accommodate one or more magnets.

3. The high-speed magnetic trolley according to claim **2**, wherein the removable bar includes a harness attachment loop disposed on each end of the removable bar to accommodate coupling the chair harness to the removable bar.

4. The high-speed magnetic trolley according to claim **2**, wherein the number of magnets placed inside the high-speed magnetic trolley is in the range of 1 to 20 in order to adjust an amount of braking power.

5. The high-speed magnetic trolley according to claim **2**, wherein the one or more magnets are coupled in place magnetically by the magnet holder plates.

6. The high-speed magnetic trolley according to claim **2**, wherein the harness is a chair harness.

7. A high-speed magnetic trolley, comprising:

a body having a pair of planar trapezoidal shape parallel plates, the pair of parallel plates includes a plurality of harness coupling apertures to accommodate coupling a chair harness;

a removable bar extended through a pair of aligned apertures disposed on the pair of parallel plates, the removable bar utilized as a harness anchor that is ridden with the chair harness, wherein the removable bar includes a harness attachment loop disposed on each end of the removable bar to accommodate coupling the chair harness to the removable bar and wherein when the removable bar is removed, the high-speed magnetic trolley can be placed on a zip line cable;

a plurality of wheels placed between the pair of parallel plates, each wheel includes a fitted track on a middle circumference portion of each wheel that accommodates the zip line cable, the wheels have a rubber coating on the middle circumference portion and the wheels rotate while in contact with the zip line cable;

one or more spacers that define an open area between the pair of parallel plates where the wheels are placed, the open area between the one or more magnets and the wheels comprises a distance in the range of 1/32 of an inch to 1/4 of an inch to provide more or less braking capability;

a plurality of body bolts extended through a first set of corresponding apertures, the first set of corresponding apertures disposed on the pair of parallel plates and the body bolts to couple the one or more spacers in place;

a plurality of axles extended through a second set of apertures disposed on the pair of parallel plates and a centered aperture disposed on each of the wheels, the axles

to couple the wheels in place while allowing the wheels to rotate; and a plurality of magnet holder plates coupled to an exterior facing of the pair of parallel plates on an opposite side of the pair of parallel plates adjacent to the wheels, the magnet holder plates coupled with a plurality of fasteners and the magnet holder plates are generally planar shaped and include an aperture to accommodate one or more magnets, wherein the fasteners are a plurality of bolts, the one or more magnets placed inside the high-speed magnetic trolley are in the range of 1 to 20 in order to adjust an amount of braking power and the one or more magnets are coupled in place magnetically by the magnet holder plates.

8. The high-speed magnetic trolley according to claim **7**, wherein the pair of parallel plates are made of aluminum.

9. The high-speed magnetic trolley according to claim **7**, wherein the removable bar is made of stainless steel.

10. The high-speed magnetic trolley according to claim **7**, wherein the wheels are made of aluminum.

11. The high-speed magnetic trolley according to claim **7**, wherein each of the wheels has a polyurethane coating on the middle circumference portion.

12. The high-speed magnetic trolley according to claim **7**, wherein the one or more spacers are made of aluminum.

13. The high-speed magnetic trolley according to claim **7**, wherein the body bolts and the axles are made of stainless steel.

14. The high-speed magnetic trolley according to claim **7**, wherein the magnet holder plates are made of steel.

* * * * *